

# **IE 410 – INTRODUCTION TO ROBOTICS**

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## **Lab-10 report**

**Network Configuration for TurtleBot, Connecting with TurtleBot,  
SSH into a remote system.**

### **Team M410:**

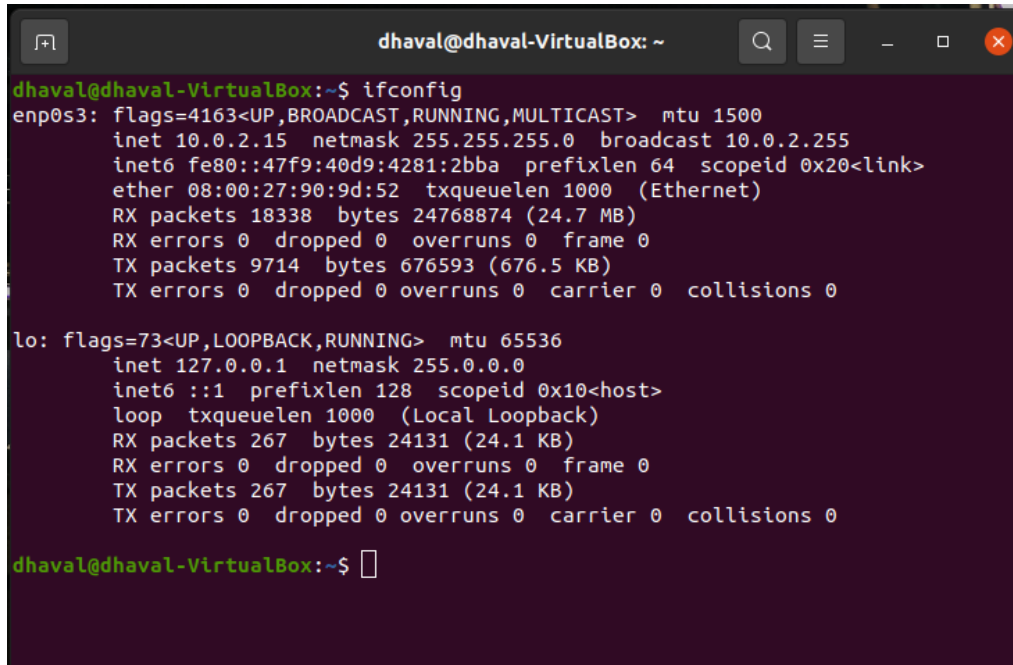
201901011 – HIMANSHU DUDHATRA

201901024 – DHAVALSINH RAJ

201901100 – SHUBHAM PATEL

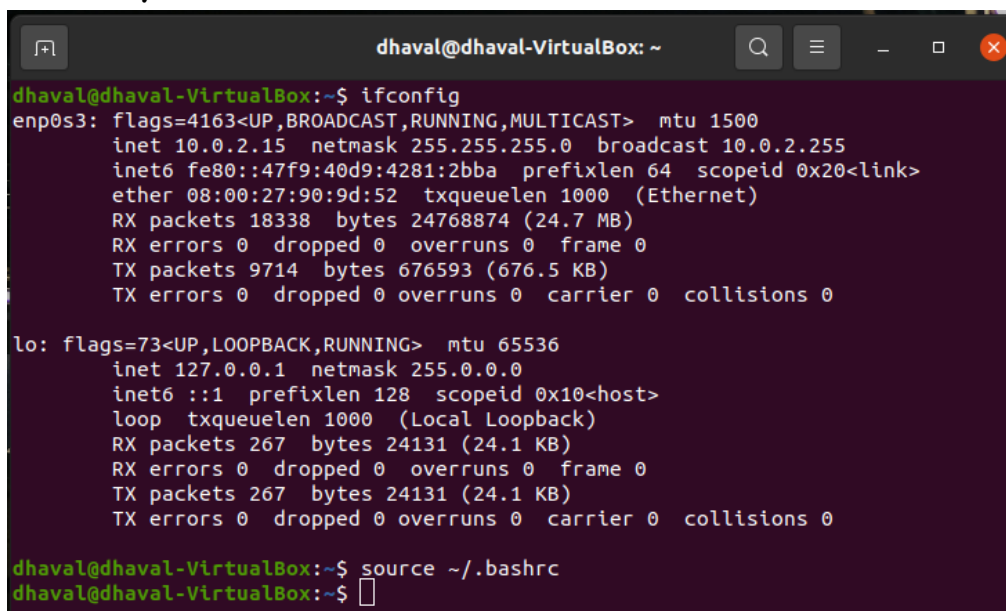
201901145 – GARGEY PATEL

- Install net tools by running following command in terminal  
**\$ sudo apt install net-tools**
- Find ip address by command **\$ ifconfig**



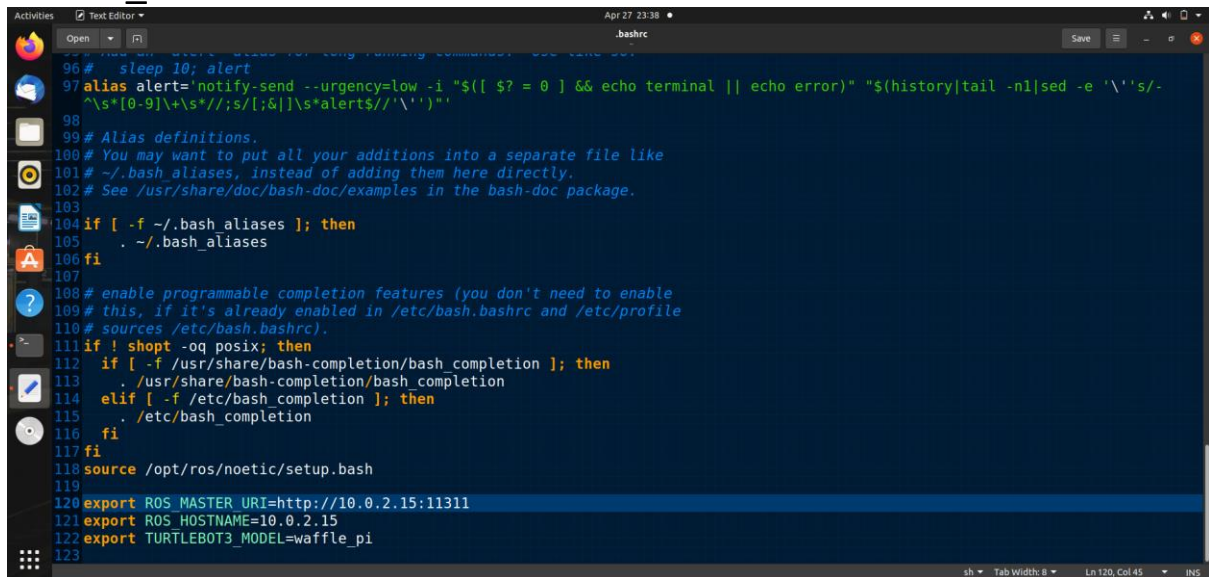
```
dhaval@dhaval-VirtualBox: ~  
dhaval@dhaval-VirtualBox:~$ ifconfig  
enp0s3: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500  
    inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255  
    inet6 fe80::47f9:40d9:4281:2bba prefixlen 64 scopeid 0x20<link>  
    ether 08:00:27:90:9d:52 txqueuelen 1000 (Ethernet)  
    RX packets 18338 bytes 24768874 (24.7 MB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 9714 bytes 676593 (676.5 KB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536  
    inet 127.0.0.1 netmask 255.0.0.0  
    inet6 ::1 prefixlen 128 scopeid 0x10<host>  
    loop txqueuelen 1000 (Local Loopback)  
    RX packets 267 bytes 24131 (24.1 KB)  
    RX errors 0 dropped 0 overruns 0 frame 0  
    TX packets 267 bytes 24131 (24.1 KB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
dhaval@dhaval-VirtualBox:~$
```

- Install SSH server by running following command in terminal  
**\$ sudo apt-get install openssh-server**
- update the ROS IP settings by the command below  
**\$ nano ~/.bashrc**



```
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dhaval@dhaval-VirtualBox:~$ ifconfig  
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    inet 10.0.2.15 netmask 255.255.255.0 broadcast 10.0.2.255  
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    TX packets 267 bytes 24131 (24.1 KB)  
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0  
  
dhaval@dhaval-VirtualBox:~$ source ~/.bashrc  
dhaval@dhaval-VirtualBox:~$
```

- Now Modify the address of localhost in the ROS\_MASTER\_URI and ROS\_HOSTNAME

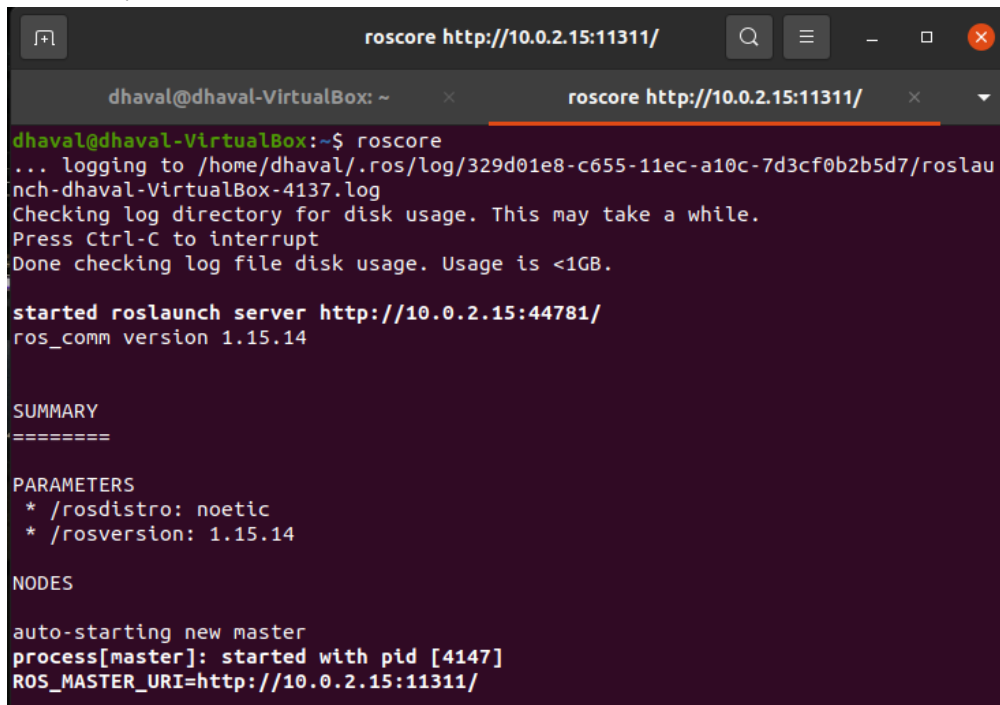


```

96# sleep 10; alert
97alias alert='notify-send --urgency=low -i "${[ $? = 0 ] && echo terminal || echo error}" "$(history|tail -n1|sed -e '\''s/^\s*[0-9]\+\s*//;s/;;s/;&[]\s*alert$//'\''")'"
98
99# Alias definitions.
100# You may want to put all your additions into a separate file like
101# ~/.bash_aliases, instead of adding them here directly.
102# See /usr/share/doc/bash-doc/examples in the bash-doc package.
103
104if [ -f ~/.bash_aliases ]; then
105    . ~/.bash_aliases
106fi
107
108# enable programmable completion features (you don't need to enable
109# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
110# sources /etc/bash.bashrc).
111if ! shopt -oq posix; then
112    if [ -f /usr/share/bash-completion/bash_completion ]; then
113        . /usr/share/bash-completion/bash_completion
114    elif [ -f /etc/bash_completion ]; then
115        . /etc/bash_completion
116    fi
117fi
118source /opt/ros/noetic/setup.bash
119
120export ROS_MASTER_URI=http://10.0.2.15:11311
121export ROS_HOSTNAME=10.0.2.15
122export TURTLEBOT3_MODEL=waffle_pi
123

```

- Source the bashrc with given command  
\$ **nano ~/bashrc**
- Now run \$ **roscore** command



```

roscore http://10.0.2.15:11311/
dhaval@dhaval-VirtualBox: ~
dhaval@dhaval-VirtualBox:~$ roscore
... logging to /home/dhaval/.ros/log/329d01e8-c655-11ec-a10c-7d3cf0b2b5d7/roslau
nch-dhaval-VirtualBox-4137.log
Checking log directory for disk usage. This may take a while.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://10.0.2.15:44781/
ros_comm version 1.15.14

SUMMARY
=====

PARAMETERS
* /rostdistro: noetic
* /rosversion: 1.15.14

NODES

auto-starting new master
process[master]: started with pid [4147]
ROS_MASTER_URI=http://10.0.2.15:11311/

```

- Open a new terminal and connect to TurtleBot by given command  
\$ **ssh ubuntu@{TUTLEBOT\_IP\_ADDRESS}**

- Bring up basic packages to start TurtleBot3 applications.  

```
$ export TURTLEBOT3_MODEL=${TB3_MODEL}
$ roslaunch turtlebot3_bringup turtlebot3_robot.launch
```
- To test that the configuration, run the following command in robot machine that is connected to the turtlebot:  

```
$ roscore
```
- In our workstation machine, write the following command:  

```
$ rostopic list
```
- We should be able to see the list of topics available in the robot machine:  

```
$/rosout
$rosout_agg
```
- To check whether the Master node can receive data from the host node, run this command in a workstation PC terminal:  

```
$ rostopic pub -r10 /hello std_msgs/String "hello"
```
- On the robot machine that is already running the Master node, run the following command in a new terminal:  

```
$ rostopic echo /hello
```
- The message “hello” should appear.